



**Integrated hotspots management and saving the living Black Sea ecosystem -  
HOT BLACK SEA  
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# **Environmental and integrated criteria for Hot Spots assessment and ranking**

**Volodymyr Kresin**

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**Second Workshop – Hot Spots Methodology**

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## **Stage 3**

# **Environmental criteria for assessment of Hot Spots Candidates**

<b>Criteria</b>	<b>Weight</b>
<b>Wastewater discharge volume</b>	<b>1</b>
<b>Distance to the Black Sea or the shortest distance on the aquatic area</b>	<b>0,8</b>
<b>The type of wastewater treatment used</b>	<b>1</b>
<b>Characteristics of flow and mixing in the aqueous environment</b>	<b>0,8</b>
<b>The degree of environmental hazard</b>	<b>1</b>
<b>Environmental tension at the location of the Hot Spot candidate</b>	<b>0,8</b>

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## **Waste water discharge volume**

- score 1 discharge volume is up to 10 th. m<sup>3</sup>/day
- score 2 discharge volume is 10 to 50 th. m<sup>3</sup>/day
- score 3 discharge volume is 50 to 100 th. m<sup>3</sup>/ day
- score 4 discharge volume is more than 100 th. m<sup>3</sup>/day

## Waste water discharge volume (for urban surface run-off)

		For urban surface run-off	
		if data on WW volumes are available	in the absence of data on WW volumes
score 1	discharge volume is up to 10 th m <sup>3</sup> /day	< 5 mln m <sup>3</sup> /year	Population of the town is less than 500,000 чел
score 2	discharge volume is 10 to 50 th m <sup>3</sup> /day	5-10 mln m <sup>3</sup> /year	Population of the town is 500,000-1,000,000
score 3	discharge volume is 50 to 100 th m <sup>3</sup> / day	10-15 mln m <sup>3</sup> /year	Population of the town is 1.0 – 1.5 mln.
score 4	discharge volume is more than 100 th m <sup>3</sup> /day	More than 15 mln m <sup>3</sup> /year	Population of the town is more than 1.5 mln



## **Distance to the Black Sea or the shortest distance along the aquatic area (for lakes, lagoons etc.)**

- score 1 discharge at a distance of more than 100 km
- score 2 discharge at a distance of 50 to 100 km
- score 3 discharge at a distance of 10 to 50 km
- score 4 discharge at a distance of less than 10 km
- score 5 discharge directly to the sea

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## **Type of waste water treatment used**

- score 1 physical and biological methods of waste water treatment (for example, sedimentation tanks, aeration tanks, constructed wetlands, reed beds etc.) for municipal WWTPs; physical and chemical ones (e.g., coagulation, flocculation, ion exchange) for industrial enterprises.
- score 2 physical and chemical methods of waste water treatment (for example, treatments by using chemicals etc.) for municipal WWTPs; physical and chemical (e.g., flotation, electroosmosis) or chemical ones (oxidation, reduction, neutralization) for industrial enterprises.
- score 3 – other physical methods of waste water treatment (for example, aeration)
- score 4 – mechanical methods of waste water treatment (grids, sand traps, primary sedimentation tanks, screens)
- score 5 – absence of waste water treatment facilities

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## Characteristics of flow and mixing in the aqueous environment

- score 1 – high degree of mixing (for open waters – sea and big rivers)
- score 2 – moderate mixing (semi-open estuaries, bays)
- score 3 – low degree of mixing (medium and small rivers, landlocked bays, estuaries with low mixing)

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## The degree of environmental hazard

- score 1 – the source is included in the list of local Hot Spots of the Black Sea
- score 2 – the source is included in the list of sub-national (river basin protection programs, sub-national environmental programs and documents / projects)
- score 3 – the source is included in the list of national Hot Spots of the Black Sea (national environmental programs and documents)
- score 4 – the source is included in the list of Hot Spots of the Black Sea (international /BS regional documents)
- score 5 – the source is included in the list of European or global Hot Spots.

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## **Environmental tension in the location of Hot Spot candidate**

- score 1 – environmental tension is absent – the source of pollution is situated near the nature conservancy area
- score 2 – environmental tension is low - the source of pollution is situated within the borders of the village or urban settlement, where industrial facilities are absent
- score 3 – environmental tension is medium - the source of pollution is situated in a town, where significant industrial facilities are absent
- score 4 – environmental tension is high - the source of pollution is situated within the borders of the town, where there are middle-scale industrial facilities, which do not have significant adverse impact on the environment (for example, facilities of food-processing, consumer goods production, woodworking industries etc.)
- score 5 – environmental tension is very high – the source of pollution is situated within the boundaries of town/city, where there are working enterprises of «hazardous» branches of industry (for example, chemical industry, heavy industry (metallurgy, machine building etc.)
- score 6 - environmental tension is extremely high – areas, which contain both – serious industrial activities and at the same time they are either PAs (or nearby), or bathing waters (nearby) or fishing grounds (nearby)

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**Table 1 – Preliminary Hot Spot description ¶**

Name of Hot Spot candidate¶	Location (town, region, country)¶	Waste water discharge volume¶	Distance to the Black Sea or the shortest distance on the aquatic area ¶	Population in town/village, where the point source of pollution is located¶	Type of waste water treatment used¶	Characteristics of flow and mixing in the aquatic environment¶	Degree of environmental hazard (according to existing assessments)¶	Environmental tension on site of the Hot Spot candidate¶	Final preliminary rank of the Hot Spot candidate¶
Weight factor¶		1¶	0.8¶	0.8¶	1¶	0.8¶	1¶	0.8¶	
1¶	2¶	3¶	4¶	5¶	6¶	7¶	8¶	9¶	10¶
...¶	¶	¶	¶	¶	¶	¶	¶	¶	¶

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## Final preliminary rank of the Hot Spot candidate

The final preliminary rank is calculated using a formula:

$$G = \sum_{i=3}^9 W_i \cdot V_i$$

where

G is the general preliminary rank of the Hot Spot candidate;

$W_i$  is the index weight of the *i-th* column;

$V_i$  is the weight factor of the *i-th* column.

## Stage 4

# Integrated criteria for assessment of Hot Spots

Criteria	Weight
The degree of overall impact on water quality	1,0
The degree of local impact on water quality	0,8
Recreation and protected areas	0,8
Level of potential impact on aquatic life	0,8
Investment attractiveness of the region (province)	0,5 -1
Regional development perspectives	0,5 -1

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## The degree of overall impact on water quality - $S_x$

Impact on the environment is evaluated on the base of the following two factors: the effective mass of the pollutant and the criterion of impact of the pollutant discharge into the aquatic environment.

<u>very extreme effects</u> (7)	$S_x > 40 \%$
<u>extreme effects</u> (6)	$20 \% < S_x < 40 \%$
<u>severe effects</u> (5)	$15 \% < S_x < 20 \%$
<u>major effects</u> (4)	$10 \% < S_x < 15 \%$
<u>moderate effects</u> (3)	$5 \% < S_x < 10 \%$
<u>slight effects</u> (2)	$1 \% < S_x < 5 \%$
<u>no effects</u> (1)	$S_x < 1 \%$

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## The degree of overall impact on water quality (for urban surface run-off)

### If data on WW volumes are available

### In case of absence of data on WW volumes

score 1	up to 5 mln m <sup>3</sup> /year	town population is < 500 000
score 2	5 to 10 mln m <sup>3</sup> /year	town population is 500 000 -1000 000
score 3	10 to 15 mln m <sup>3</sup> / year	town population is 1 mln -1.5 mln
score 4	more than 15 mln m <sup>3</sup> /year	town population is > 1.5 mln

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## The degree of local impact on water quality

The criterion of the local impact of the discharges of pollutants on the aquatic environment taking into account the dilution of wastewater by surface or sea waters.

This criterion is an approximate estimate of the total MAC exceeding ratio by substances discharged via the source of pollution under consideration at a distance of 50 m from the discharge under the most unfavorable weather conditions.

The reciprocal dilution of wastewater at a distance of  $L = 50$  m from its discharge under the lowest weather conditions.

The normalization of the criterion of local impact are performed in the following manner. It is calculated dimensionless quantity  $F_k$  representing the relative contribution (in percentage terms) of the  $k$ -th source of pollution in the total pollution of water by all discharges

$$F_k = \frac{f_k}{\sum_{i=1}^n f_i} \cdot 100\%$$

<u>very extreme effects</u> (7)	$F_k > 40\%$
<u>extreme effects</u> (6)	$20\% < F_k < 40\%$
<u>severe effects</u> (5)	$15\% < F_k < 20\%$
<u>major effects</u> (4)	$10\% < F_k < 15\%$
<u>moderate effects</u> (3)	$5\% < F_k < 10\%$
<u>slight effects</u> (2)	$1\% < F_k < 5\%$
<u>no effects</u> (1)	$F_k < 1\%$

## The degree of local impact on water quality (for urban surface run-off)

	If data on WW volumes are available	In case of the absence of data on WW volumes
score 1	< 3 mln m <sup>3</sup> /year	Town population is < 400,000
score 2	3-5 mln m <sup>3</sup> /year	Town population is 400,000-700,000
score 3	5-10 mln m <sup>3</sup> /year	Town population is 700,000-1,000,000
score 4	10-15 mln m <sup>3</sup> /year	Town population is 1.0 – 1.5 mln
score 5	More than 15 mln m <sup>3</sup> /year	Town population is more than 1.5 mln

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## Recreation and protected areas

score 6	Discharge is carried out directly in the recreation area or in the conservation area or in the vicinity of the wetland or in the place of mass bird nesting.
score 5	Discharges, which may cause a significant odour that directly affects a recreational area, either in the conservation area or in the location of wetlands or in the place of mass bird nesting from a distance of 500 m.
score 4	Discharges with no odour at a distance of 1,000 m from the recreational area, conservation area, wetlands and places of mass bird nesting.
score 3	Discharges at a distance of 5,000 m from the recreational area, conservation area, wetlands and places of mass bird nesting.
score 2	Discharges causing a potential risk to the environment.
score 1	No effect.

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## Level of potential impact on aquatic life

score 6	Any discharge, which may reduce the oxygen content of the receiving waterbody below 0.5 mg O <sub>2</sub> /l. Any discharge containing a heavy metal concentration of more than 50 mg/l. Any discharge containing an oil concentration of 400 mg/l
score 5	Any discharge, which may reduce the oxygen content of the receiving body below 1 mg O <sub>2</sub> /l. Any discharge containing a heavy metal concentration of more than 30 mg/l. Any discharge containing an oil concentration of 200 mg/l.
score 4	Any discharge, which may reduce the oxygen content of the receiving body below 2 mg O <sub>2</sub> /l. Any discharge containing a heavy metal concentration of more than 20 mg/l. Any discharge containing oil concentration of 100 mg/l.
score 3	Any discharge, which causes oxygen depletion.
score 2	Any suspicious discharge.
score 1	Discharge with no effect.

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**Table 2 – Summary table of Hot Spots**

Name	Type	The degree of overall impact on water quality	The degree of local impact on water quality	Recreation and protected areas	Level of potential impact on aquatic life, including biota contamination	Investment attractiveness of the region	Regional development perspectives	Weighted total	Category
Weight factor		1.0	0.8	0.8	0.8	from 0.5 to 1	from 0.5 to 1		
1	2	3	4	5	6	7	8	9	10
...									

## Final rank of the Hot Spot

The final rank is calculated using a formula:

$$G = \sum_{i=3}^9 W_i \cdot V_i$$

where

$G$  is the general rank of the Hot Spot;

$W_i$  is the index weight of the  $i$ -th column;

$V_i$  is the weight factor of the  $i$ -th column.

## Category

Depending on the amount of final weight of the pollution source, it is proposed 3 categories:

**The Hot Spot of the first rank** is an entity that requires the most attention and prompt actions from decision makers.

**The Hot Spot of the second rank** is an entity that requires attention from the decision makers and problem-solving in the short term (3 to 5 years).

**The Hot Spot of the third rank** is an entity that requires constant attention on the part of decision makers and problem-solving in the medium term (5 to 10 years).

The candidate Hot Spots, outside of the List of top HSs, obviously may later be addressed in the long-term run (over 10 years).

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**Thank you for your attention!**

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